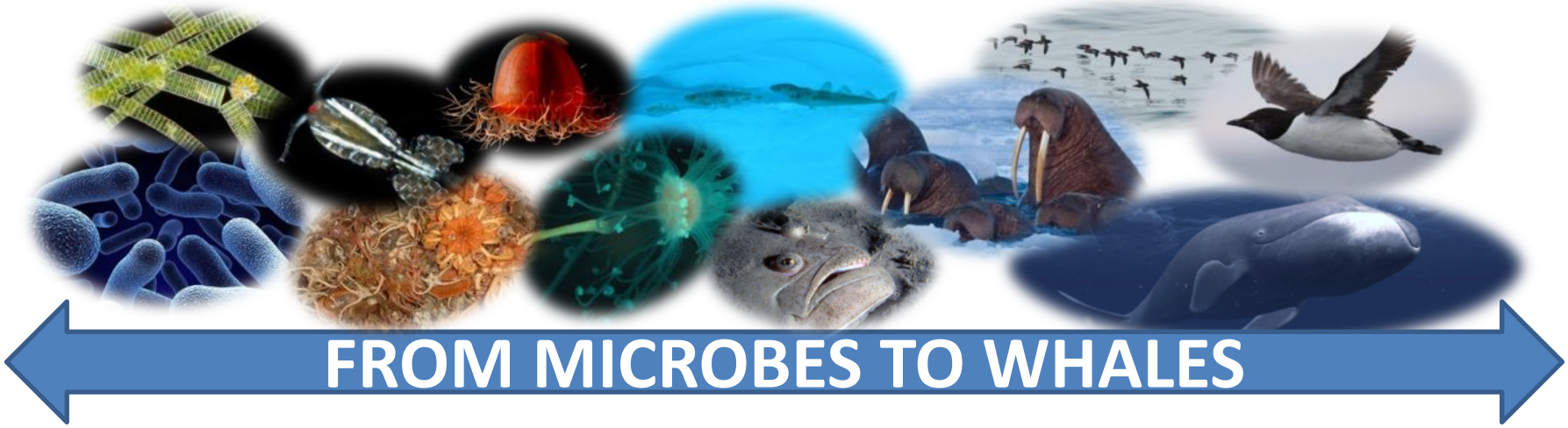


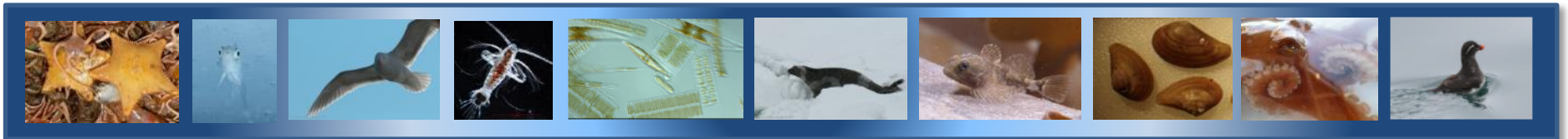
AMBON: Arctic Marine Biodiversity Observing Network

Iken K[1], Cooper L[2], Grebmeier J[2], Danielson S[1], Mueter F[1], Hopcroft R[1], Stafford K[3], Kuletz K[4], Collins E[1], Kavanaugh M[8], Bluhm B[1,5], Moore S[6], Buckelew S[7], Bochenek R[7]

(1) University of Alaska Fairbanks; USA; (2) University of Maryland, USA; (3) University of Washington, USA; (4) US Fish and Wildlife Service, USA; (5) University of Tromsø, Norway; (6) National Oceanographic and Atmospheric Administration, USA; (7) Alaska Ocean Observing System/AXIOM, USA; (8) Oregon State University

AMBON status

- What have we done in the past year, and how is that work addressing the needs of our targeted users?
- How are we measuring the impact on the user community that we serve?
- How are we progressing with shared cross-MBON priorities, advancing eDNA methods for the MBON community, and leveraging seascapes?



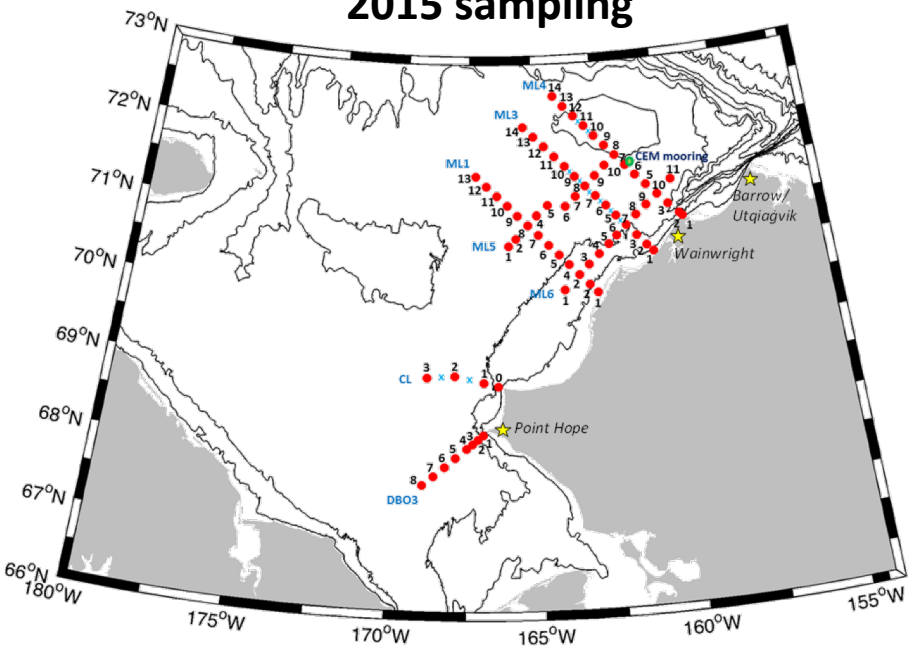
What have we done in the past year, and how is that work addressing the needs of our targeted users?

- **Field work**
- **Data publication**
- **Manuscripts**
- **Seascapes**

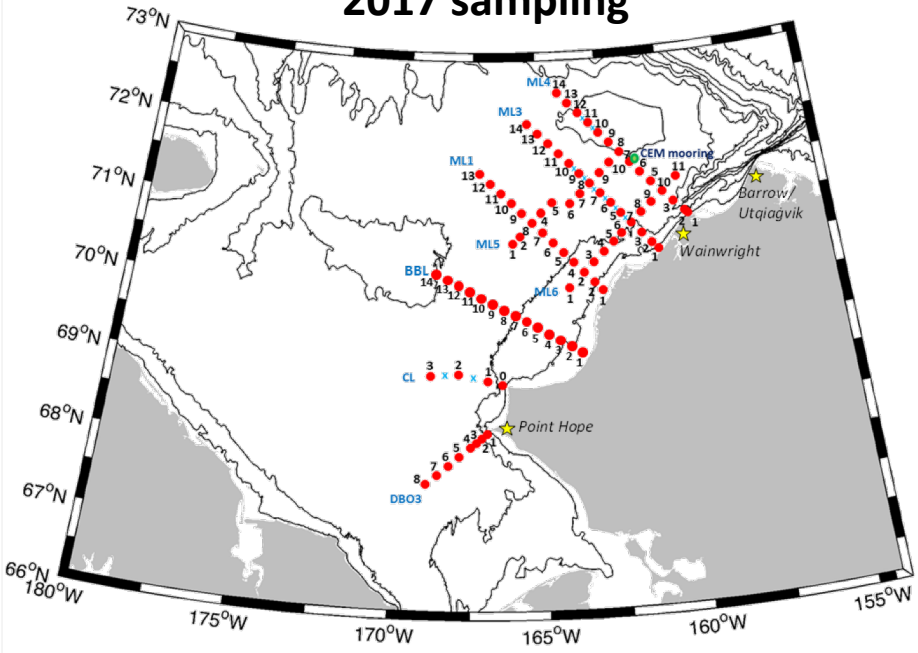
AMBON field work

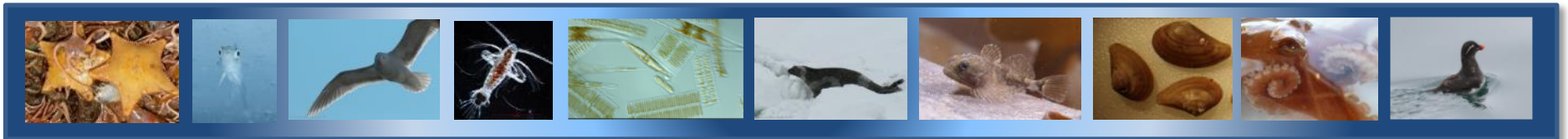
- interannual variability
- long-term data sets

2015 sampling

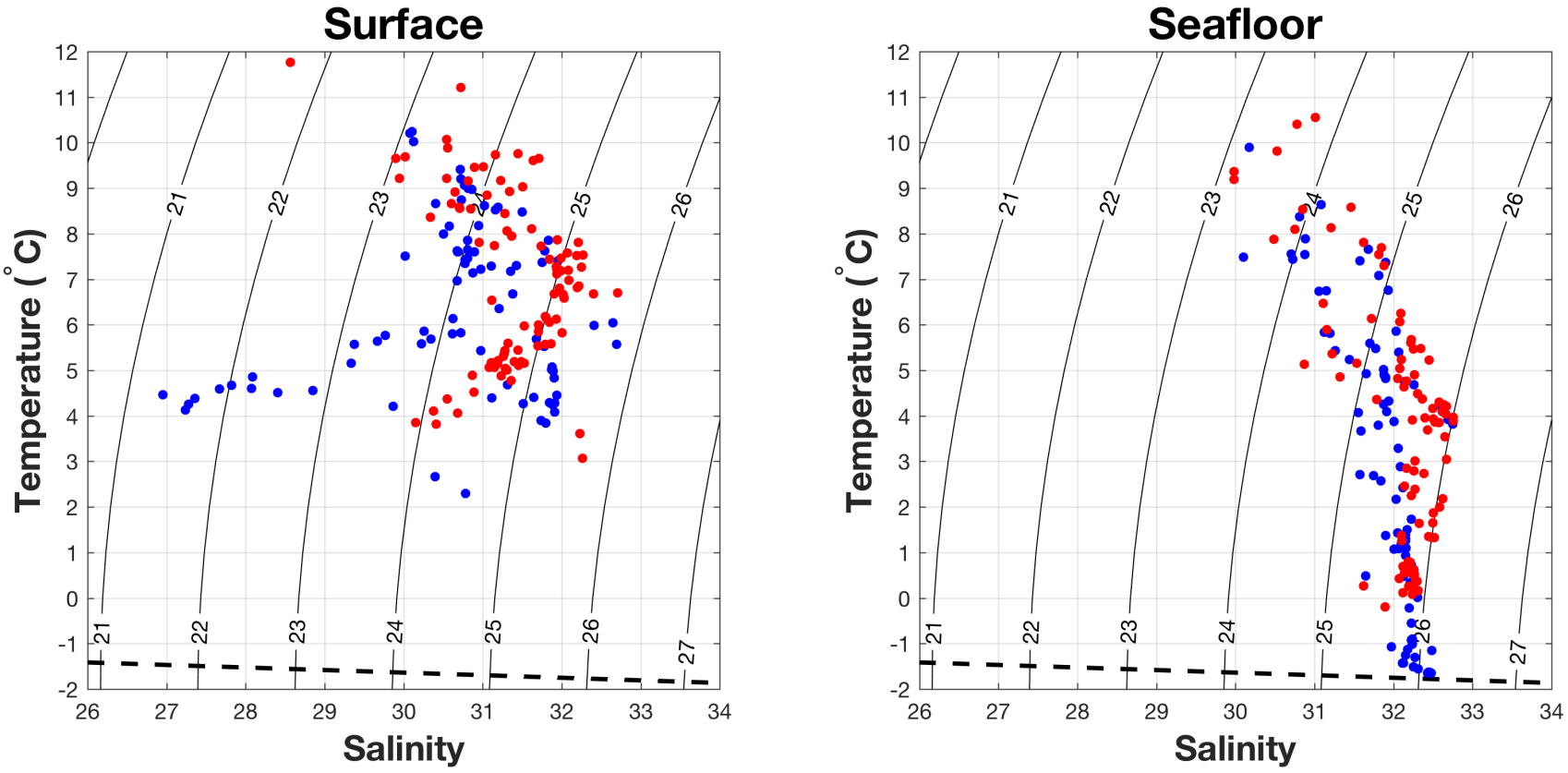


2017 sampling





- Environmental **interannual variability**



2015: fresher, colder

2017: saltier, warmer

Past year - field

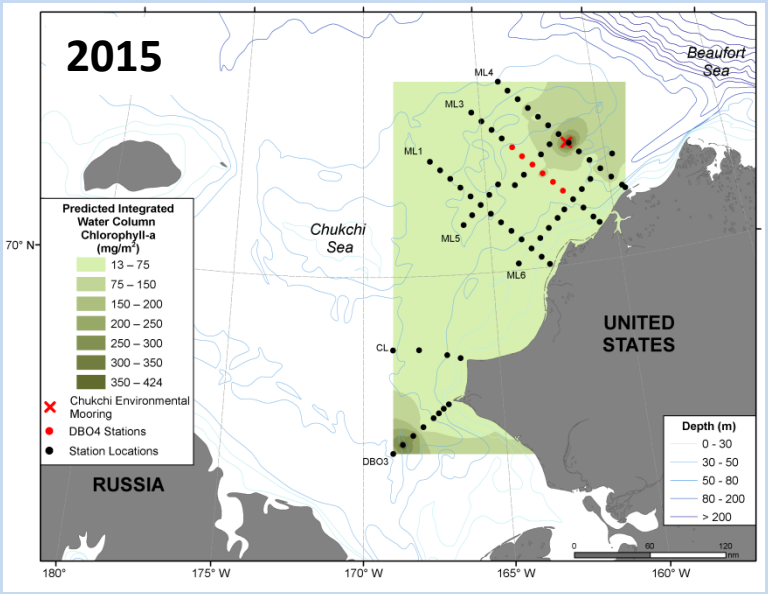
Impact

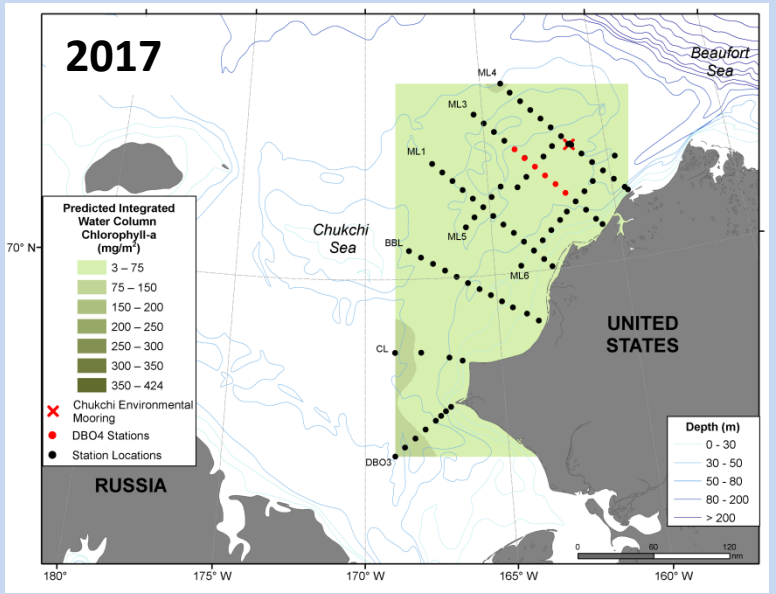
X-MBON

Water column chlorophyll

Higher in 2015

Bloom ongoing

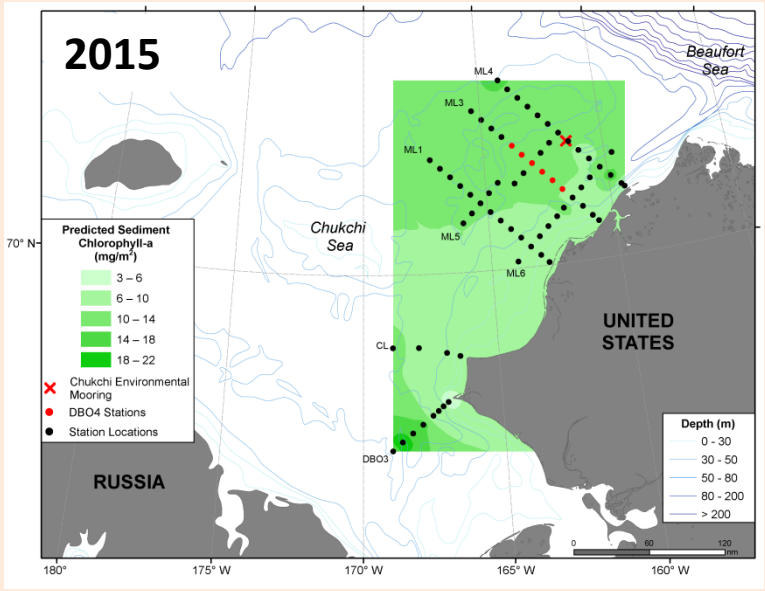


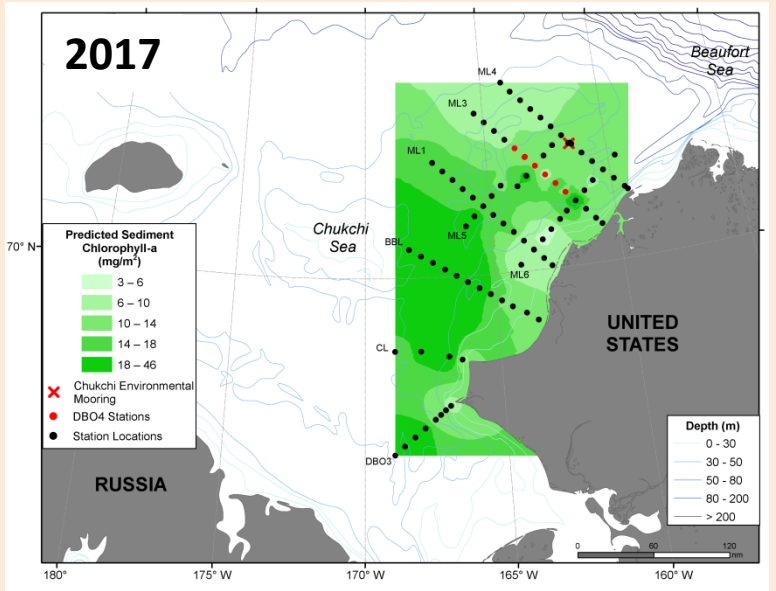


Sediment chlorophyll

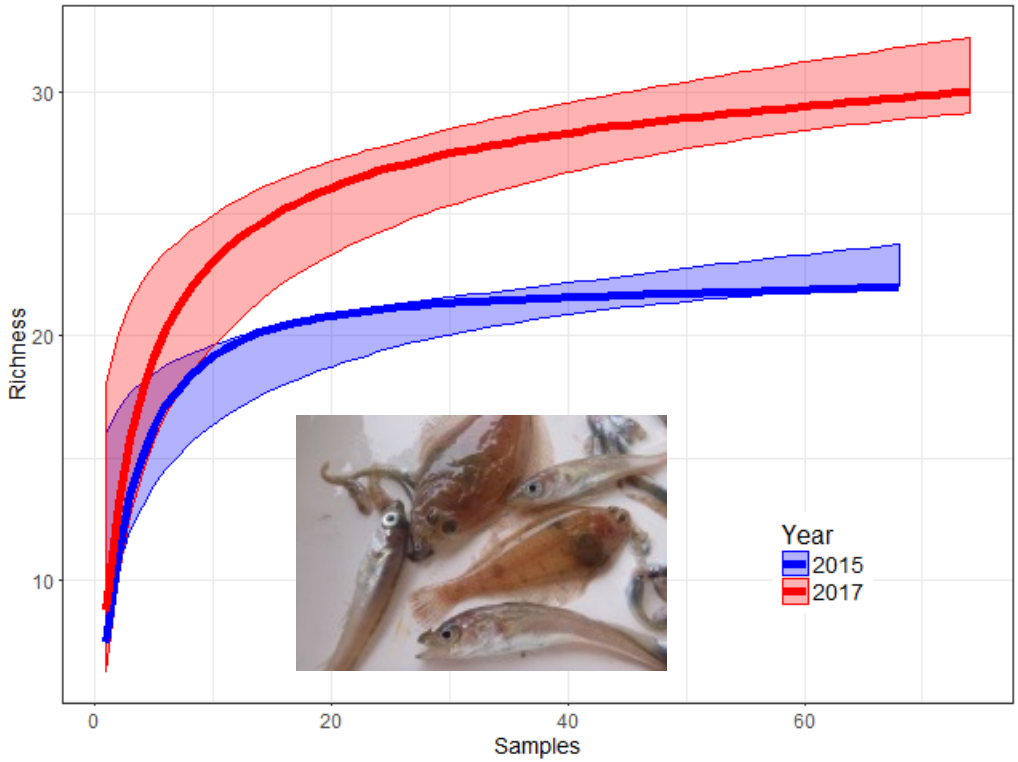
Higher in 2017

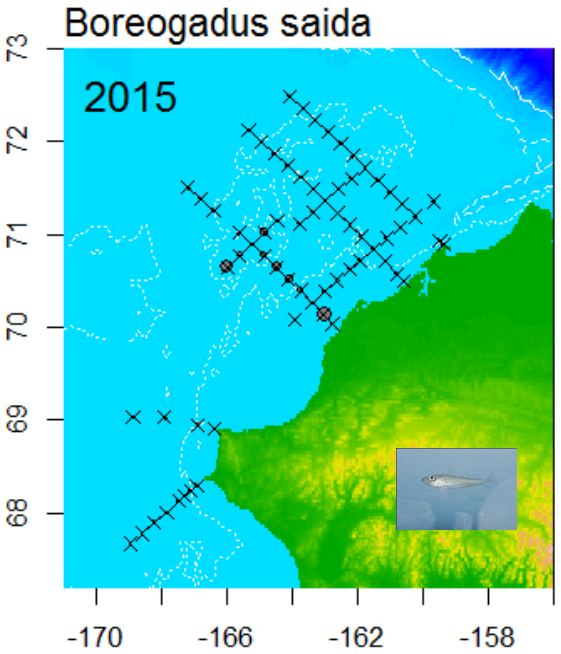
Bloom settled

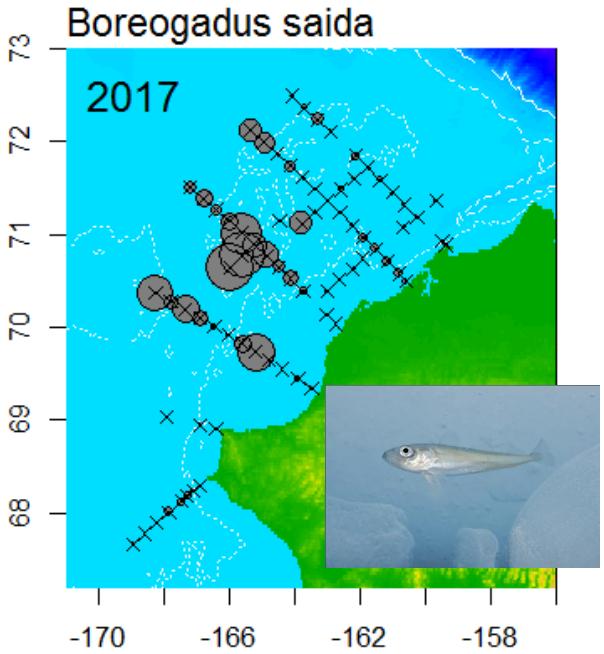




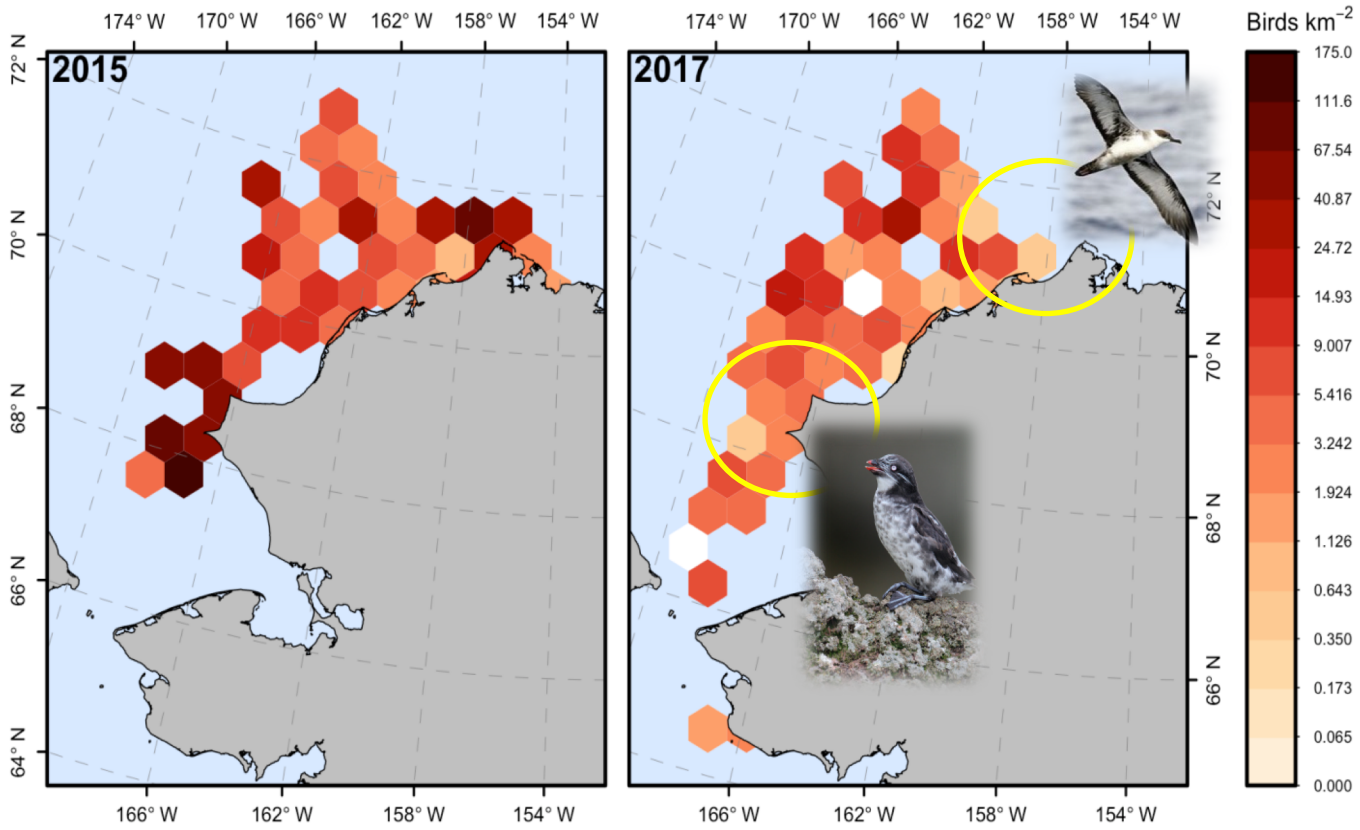
- **Interannual variability** in fish
- Higher species richness in 2017
- Higher biomass in some species (Arctic cod)
- Warmer temperatures?

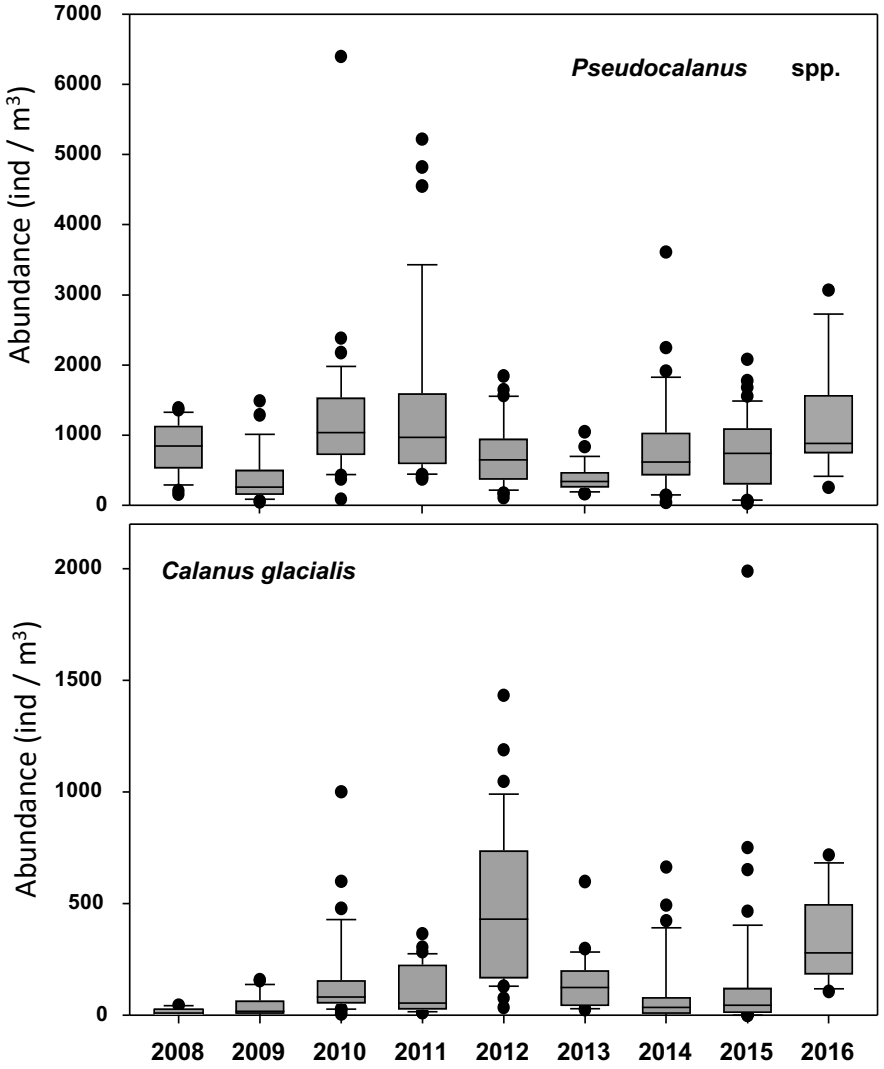




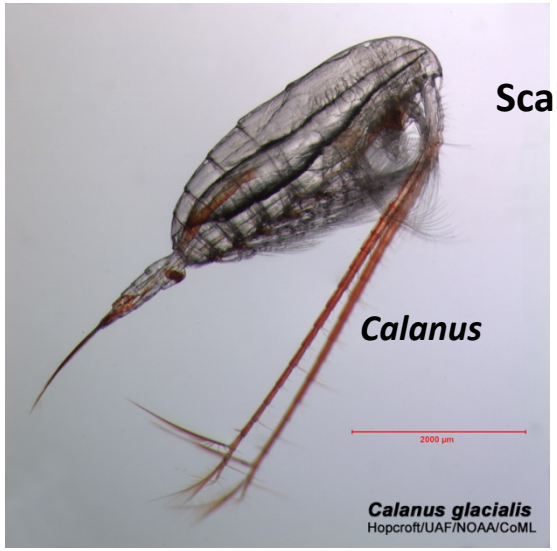


- **Interannual variability** in seabirds
- Fewer birds in 2017 than 2015
- Less shearwaters in north and less least auklets in central breeding colonies
- Poor food conditions? Low overwinter survival?





- Adding to **10-year time series** in northern Chukchi Sea
- Warm years tend to be dominated by smaller-bodied *Pseudocalanus* species
- Coldest years are dominated by larger-bodied *Calanus* species

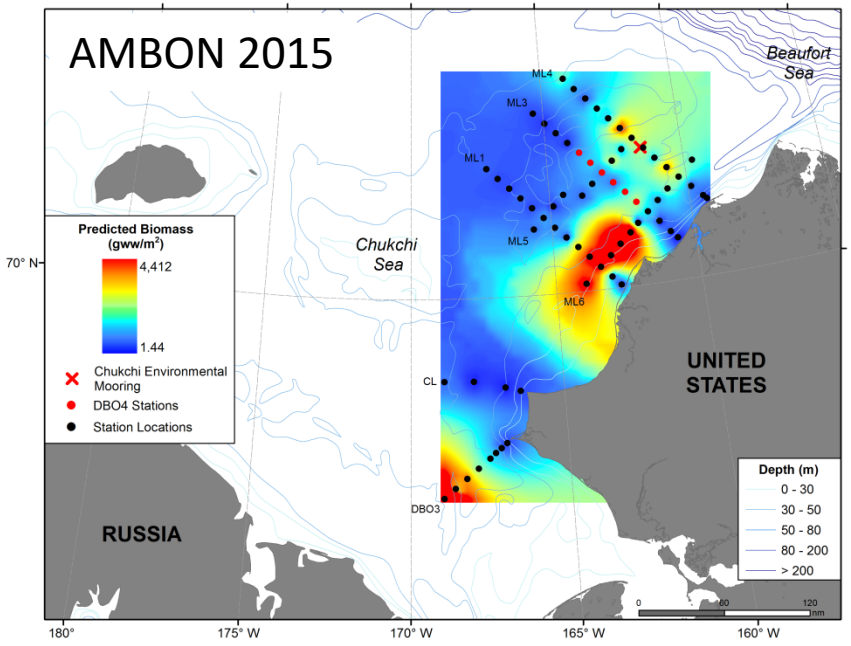


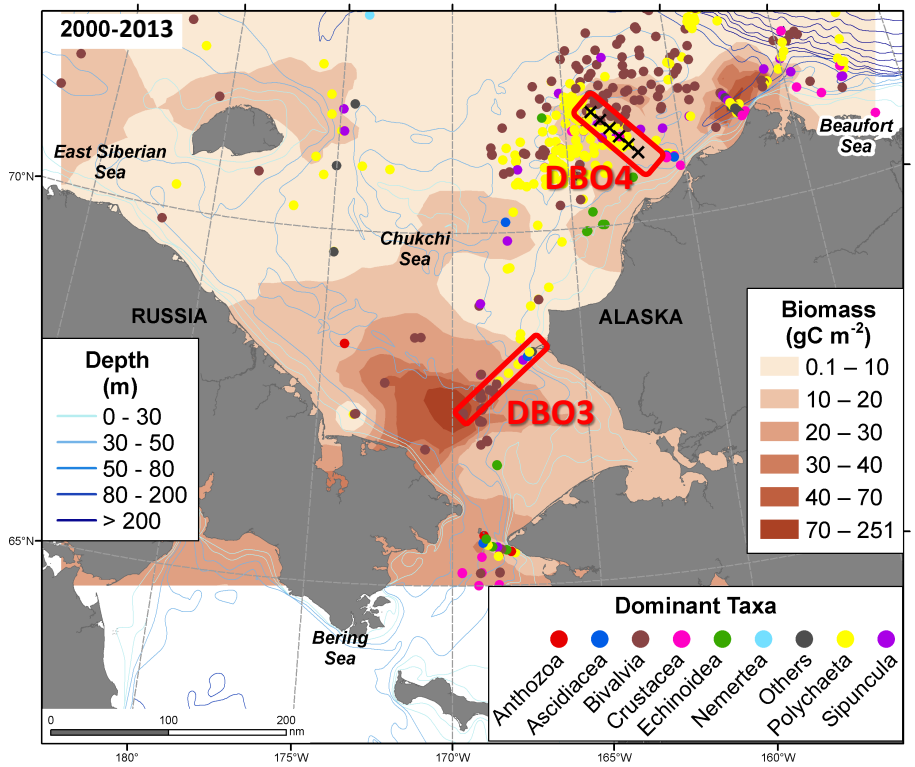
Scaled to relative size

Pseudocalanus

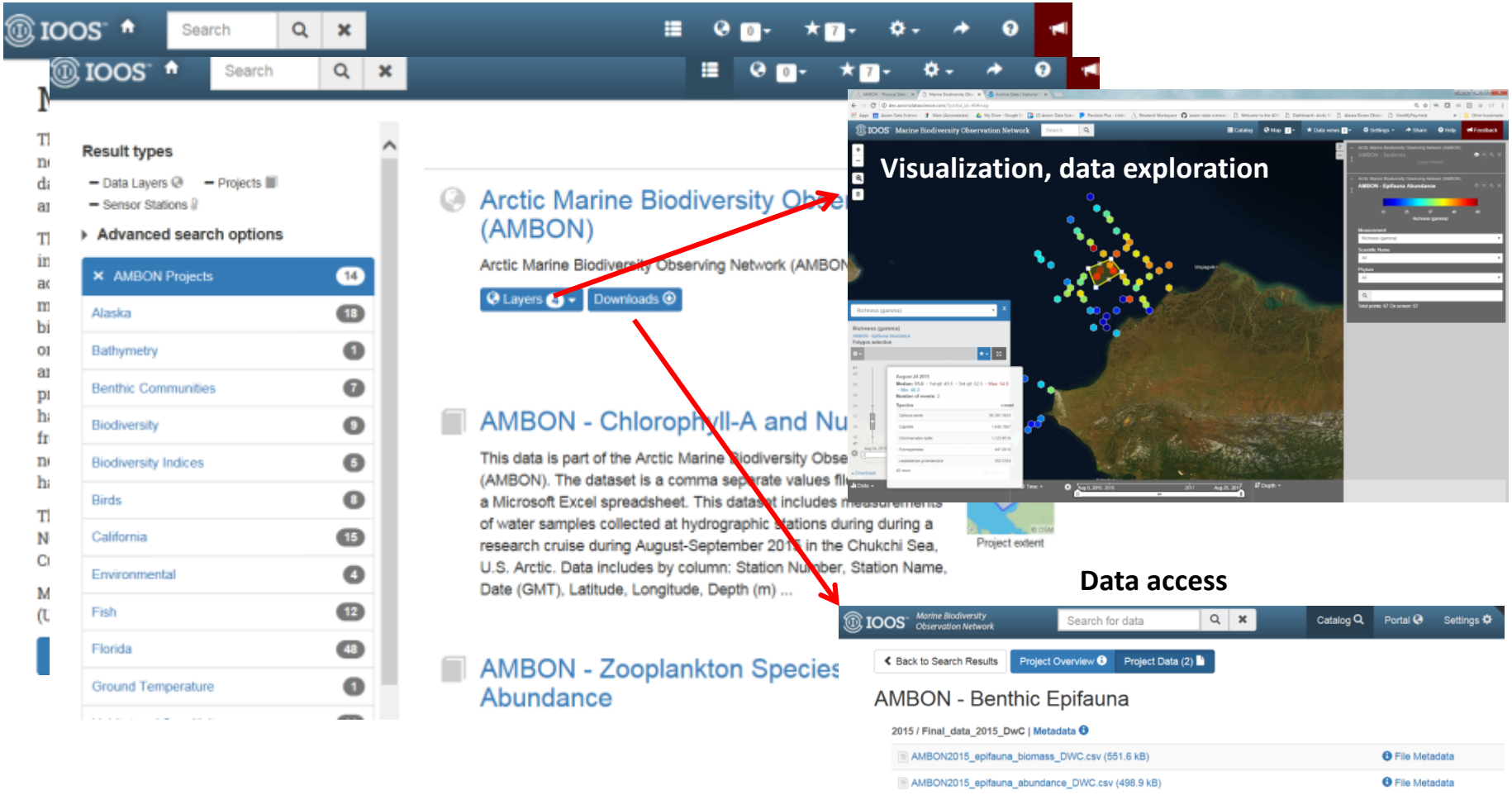
- Adding to **long-term time series**, persistence of macrofauna “hotspots”
- Link to Distributed Biological Observatory – DBO







- All project metadata represented on MBON data portal
- Use Darwin Code for biological data sets to link to NCEI
- AMBON data discoverable through the IOOS MBON data portal



Past year - manuscripts

Impact

X-MBON

In Review at Deep-Sea Research ii (DBO Special Issue)

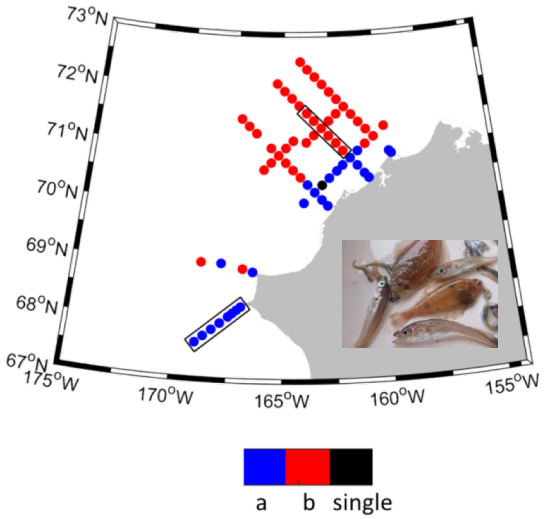
Does one size fit all? Observational design for epibenthos and fish assemblages in the Chukchi Sea

Iken K[1,*], Mueter F[1], Grebmeier JM[2], Cooper LW[2], Danielson S[1], Bluhm B[3]

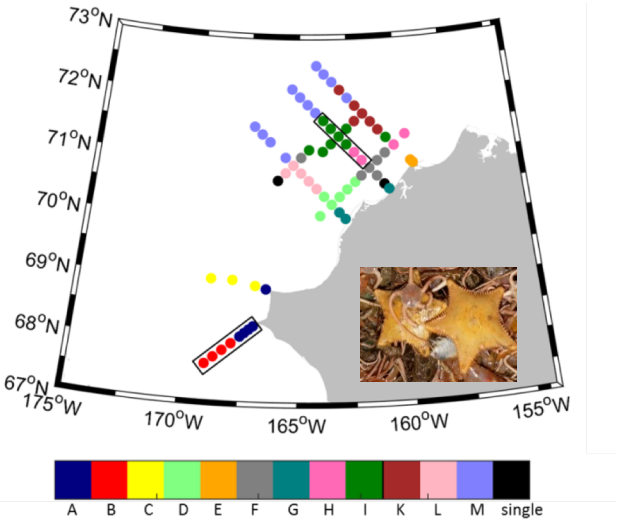
* Corresponding author: kbiken@alaska.edu, phone: 907-474 5192

Abstract

In light of ongoing, and accelerating, environmental changes in the Pacific Arctic Ocean, the ability to track subsequent changes over time in various marine ecosystem components has become a major research goal. The high logistical efforts and costs associated with arctic work demand the prudent use of existing resources for the most comprehensive information gain. Here, we compare the information that can be gained for epibenthic invertebrate and for demersal fish assemblages from two existing long-term observational programs in the Chukchi Sea: two transects of the Distributed Biological Observatory (DBO) and the Arctic Marine Biodiversity Observing Network (AMBON). The two DBO lines



- Manuscript in review using AMBON data to assess spatial observational design for epifauna and fish (AMBON *vs* DBO)
- Recommendations made for extension of DBO 4 line for fish and epifauna sampling
- Example of management application by linking DBO and AMBON

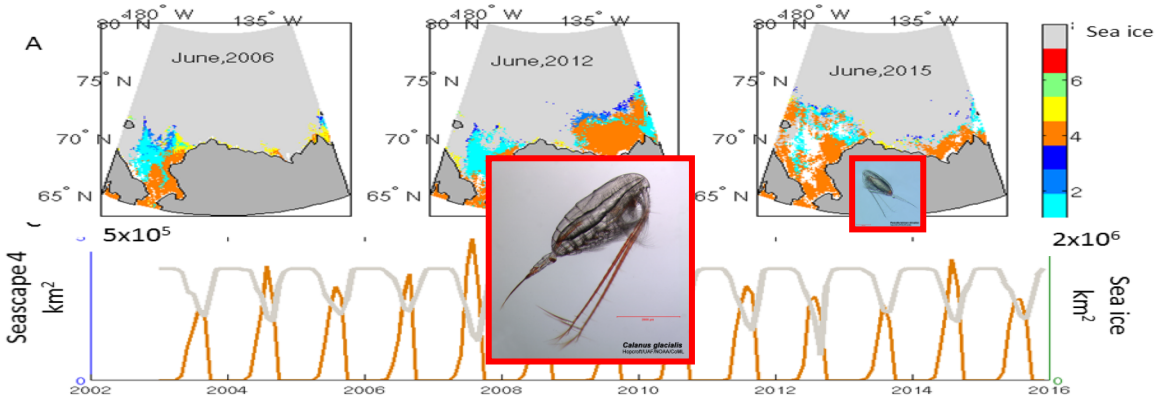


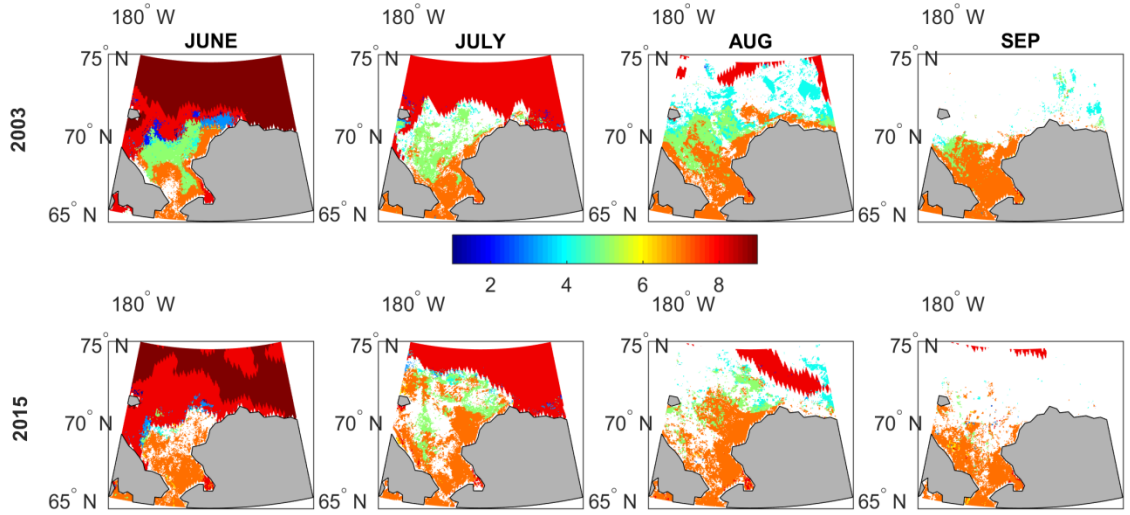
Past year - Seascapes

Impact

X-MBON

- M. Kavanaugh's NSPIRES (NASA) project now linked to AMBON
- Kick-off networking during AMBON PI meeting (Jan 2018)

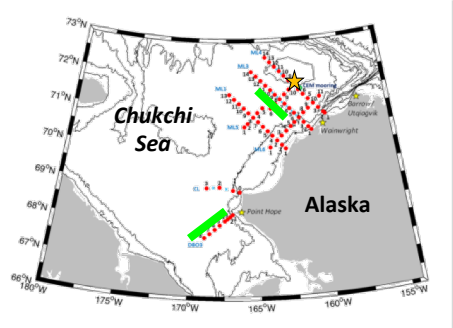




- How do dynamic seascapes characterize pelagic habitat across the array of conditions experienced in the Arctic?
- How are pelagic habitats and species associations changing in time?
- Zooplankton long-term data set ideal to test seascapes

How are we measuring the impact on the user community that we serve?

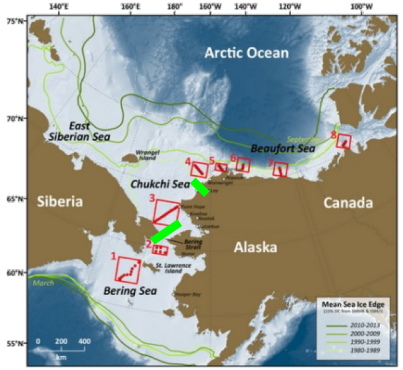
AMBON



Biodiversity focus
Large regional coverage
Microbes to whales

DBO

Distributed Biological Observatory

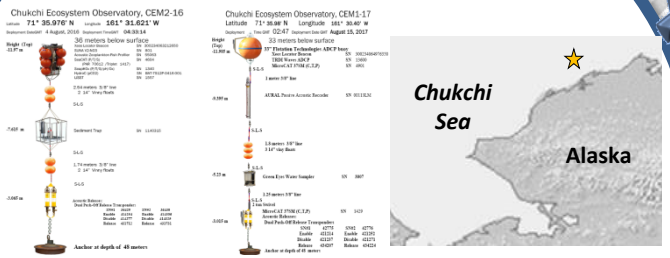


Regional biomass “hotspot” transects
Change detection array

AOOS
Alaska Ocean Observing System

CEO

Chukchi Ecosystem Observatory



Year-round high resolution ecosystem monitoring & process studies

Seascapes
Logistics
Biomass
Biodiversity
Open access
Seasonality
Complementary
Data
Temporal scale
Spatial scale

Informing management entities

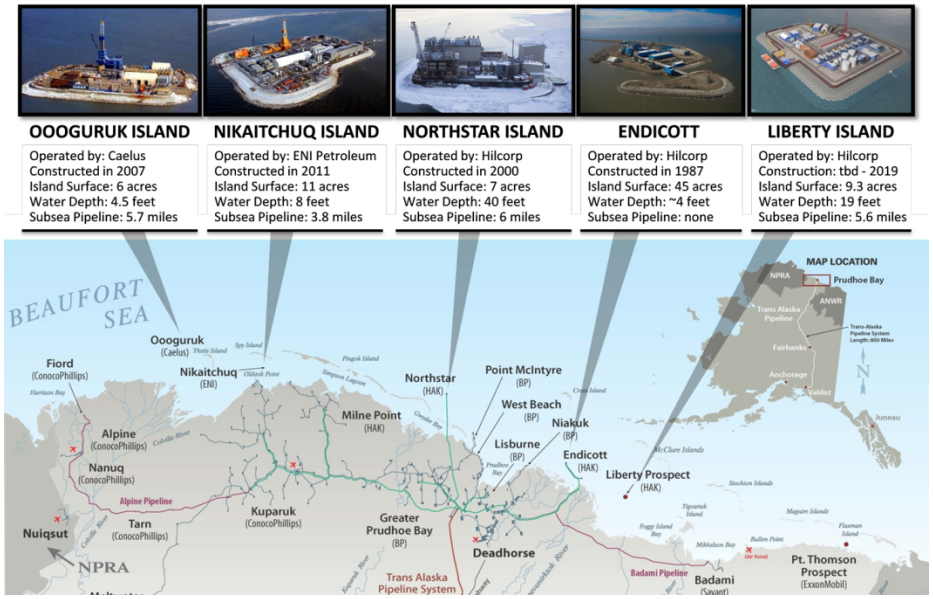
IARPC COLLABORATIONS

Interagency Arctic Research Policy Committee

- Arctic Research Plan for 2017-2021
- Goals: *Well-being*, *Stewardship*, *Security*, *Arctic-Global Systems*
- Performance elements:
  - ***4.1. Increase knowledge on the distribution and abundance of Arctic marine species across all trophic levels and scales***
    - *4.1.2. Continue studies to document Arctic marine species biodiversity (e.g. Arctic Marine Biodiversity Observation Network—AMBON—and programs that monitor loss of sea ice) and habitat use in the Arctic. Ensure datasets will be available through open access data portals…..*
  - ***4.3 Advance the understanding of how climate-related changes, biophysical interactions, and feedbacks at different scales in the marine ecosystems impact Arctic marine resources and human communities***
    - *4.3.1 Continue Distributed Biological Observatory (DBO) sampling in regions 1-5 and make data publicly available ……..*

BOEM
Bureau of Ocean Energy Management

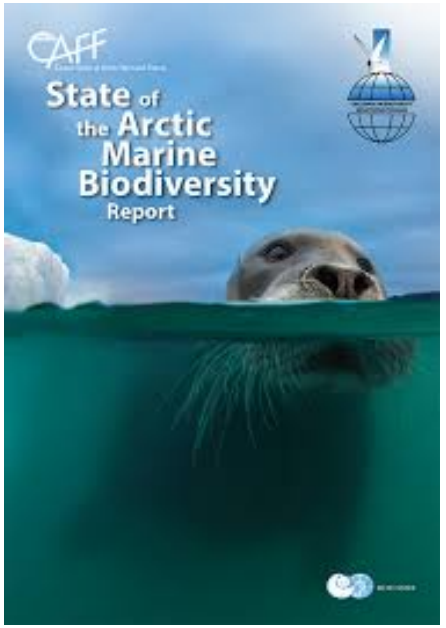
- Discussions about using AMBON template for observing network in other Arctic regions under gas & oil development (Environmental Studies Planning)

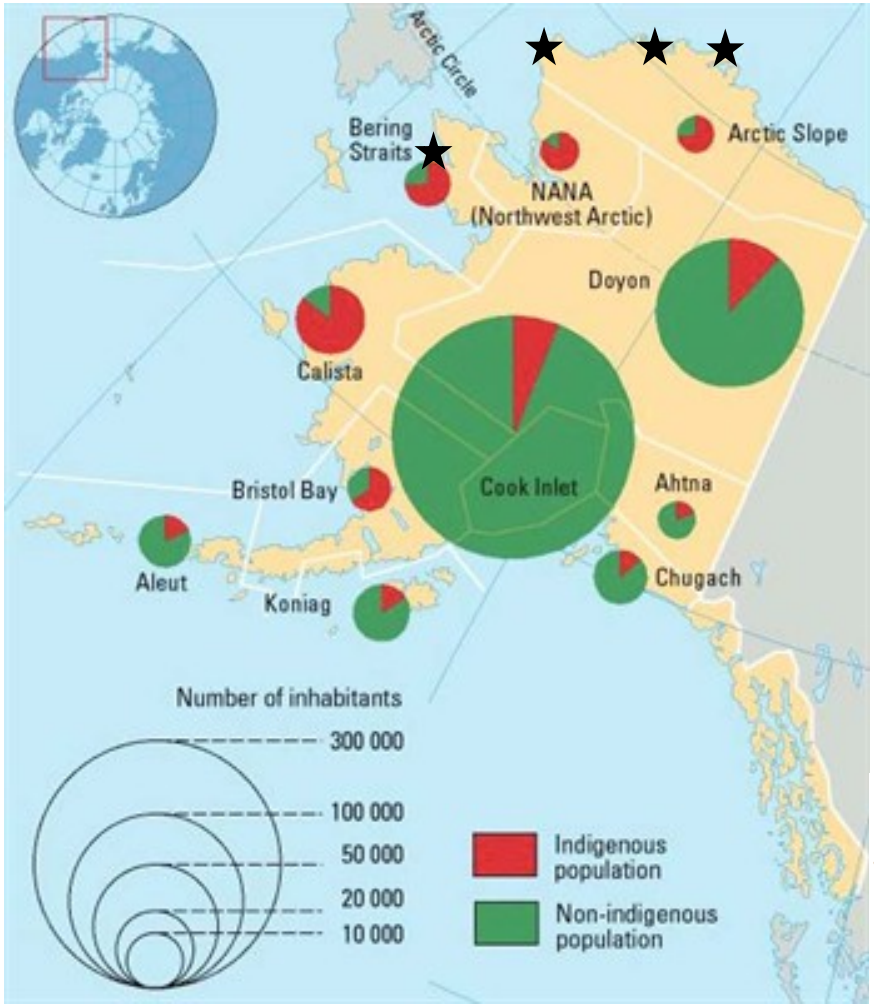


ARCTIC COUNCIL

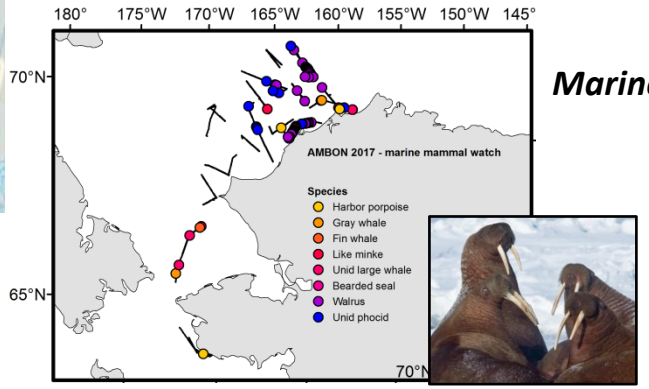
CAFF
Conservation of Arctic Flora and Fauna

- Circumpolar Biodiversity Monitoring Program (CBMP)
  - AMBON PIs as expert members in CBMP
  - State of the Arctic Marine Biodiversity Report (SAMBR, 2017)





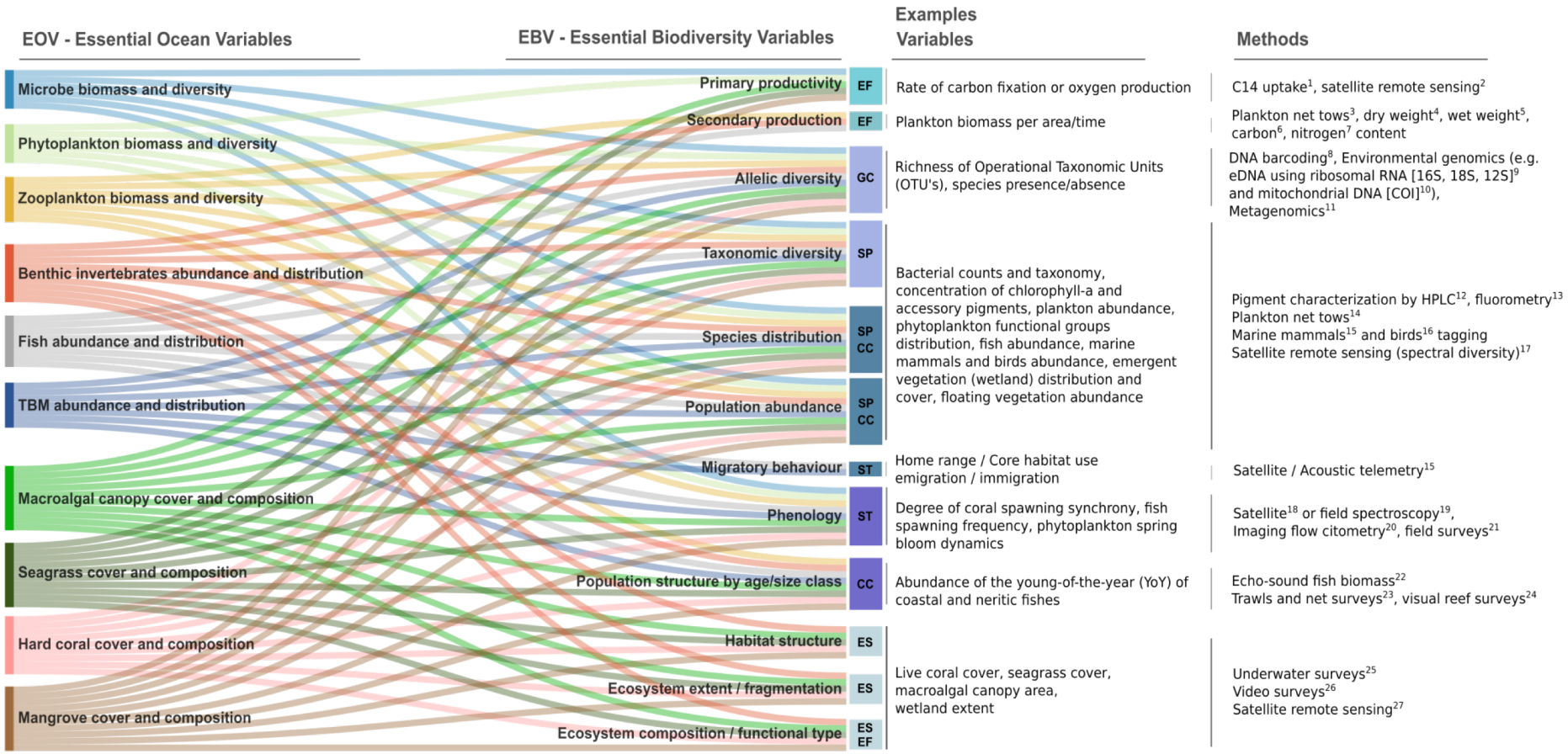
- Real-time sharing with **stakeholders**
- Daily e-mail to Native villages and managers (85 recipients)
- Presenting in Nome (Bering Strait region) before cruise
- Presenting to Alaska Eskimo Whaling Commission (AEWC)
- Presenting to Alaska Waterways Safety Committee (AWSC)



Marine mammal sightings

How are we progressing with shared cross-MBON priorities, advancing eDNA methods for the MBON community, and leveraging seascapes?

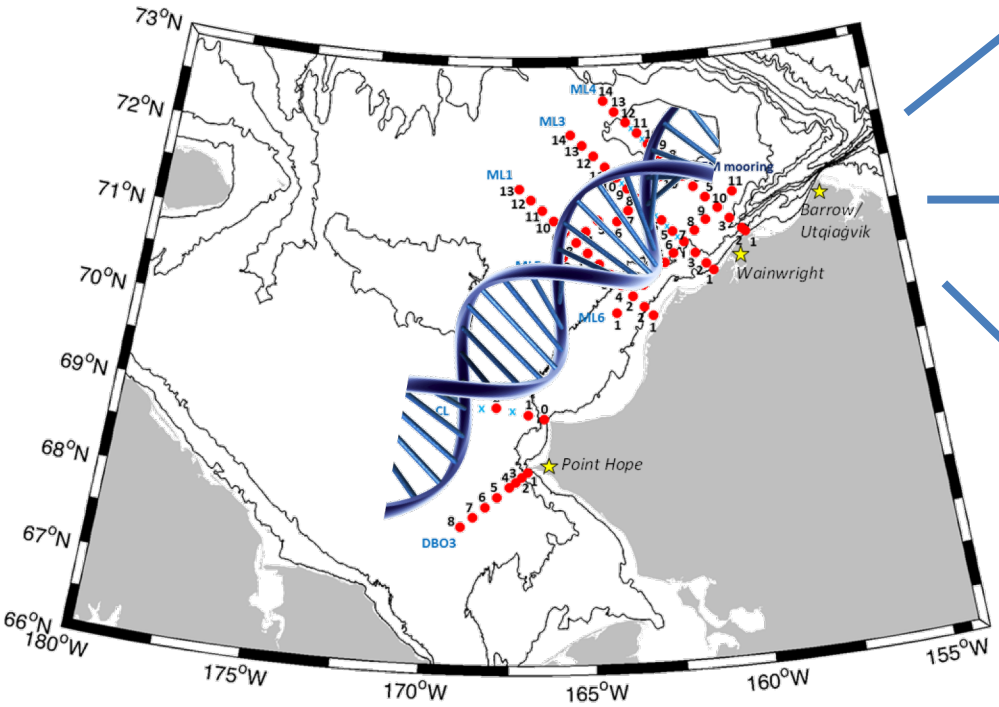
- Contribute to global efforts as feasible

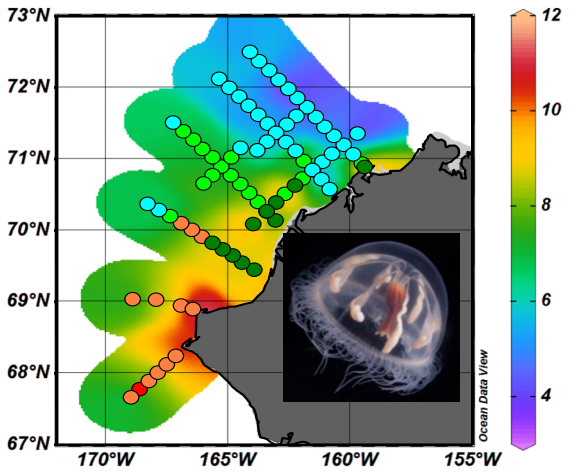


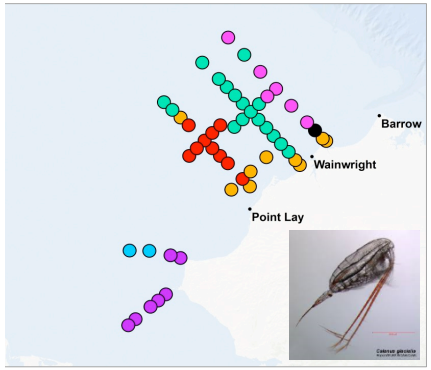
Muller-Karger and 35 co-authors, In revision *Frontiers in Marine Science*

eDNA

- Parallel effort (for consistency with historical data)
- Bacteria (16S), eukaryote (18S) and eukaryote (ITS)







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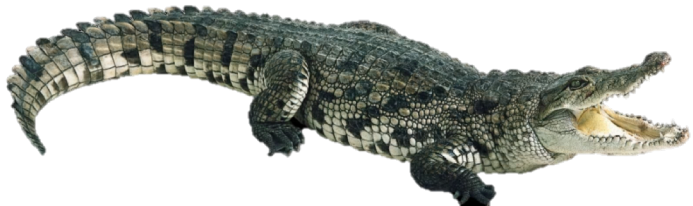
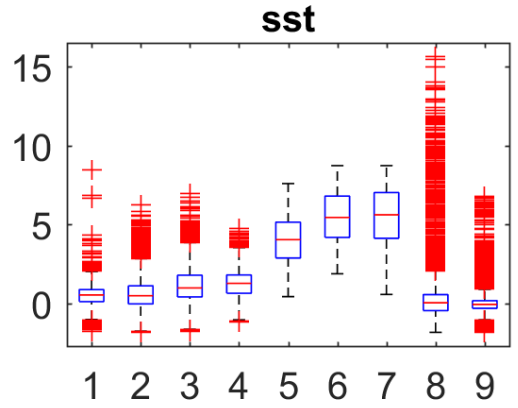
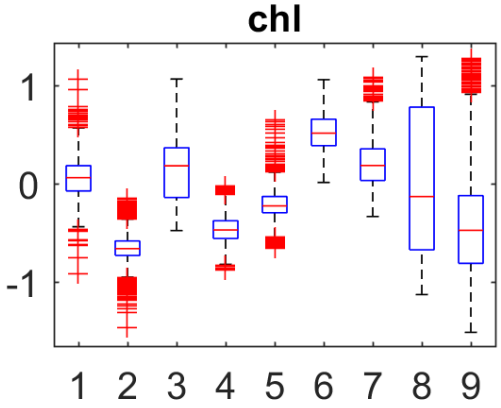


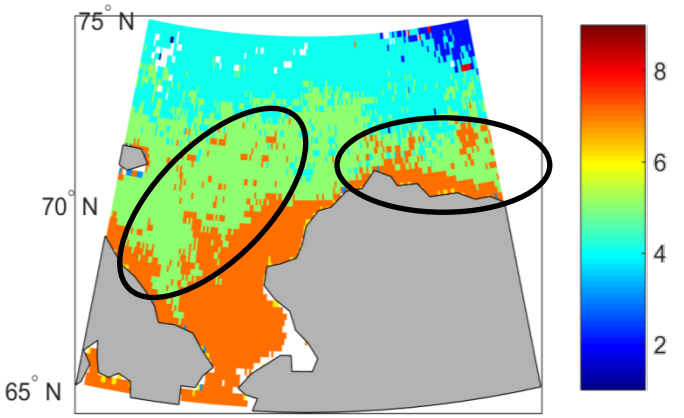
Seascapes in the Arctic

- Extend biogeographic framework across all US- MBONS
- Test classification
- Link to AMBON data (e.g., zooplankton)

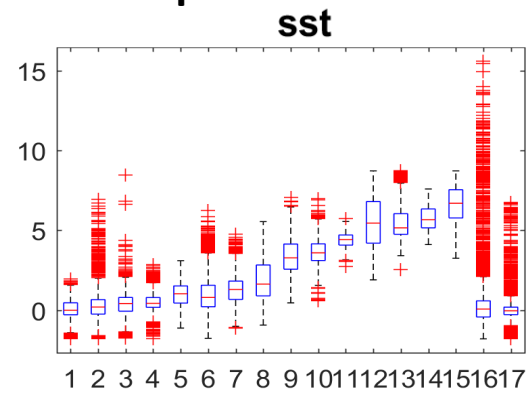
Seascape N= 9

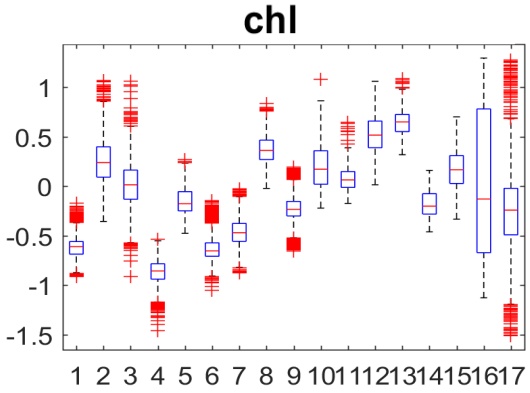


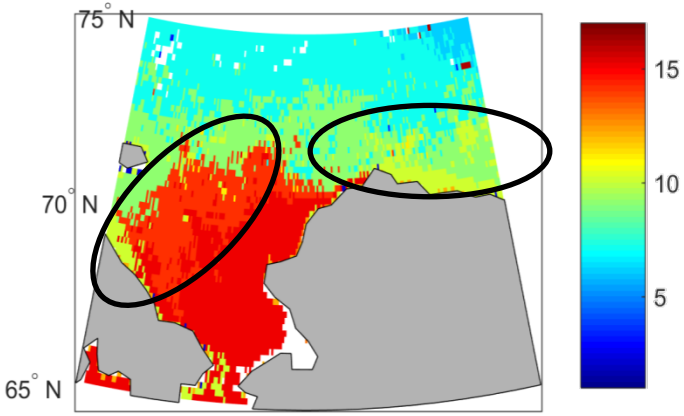




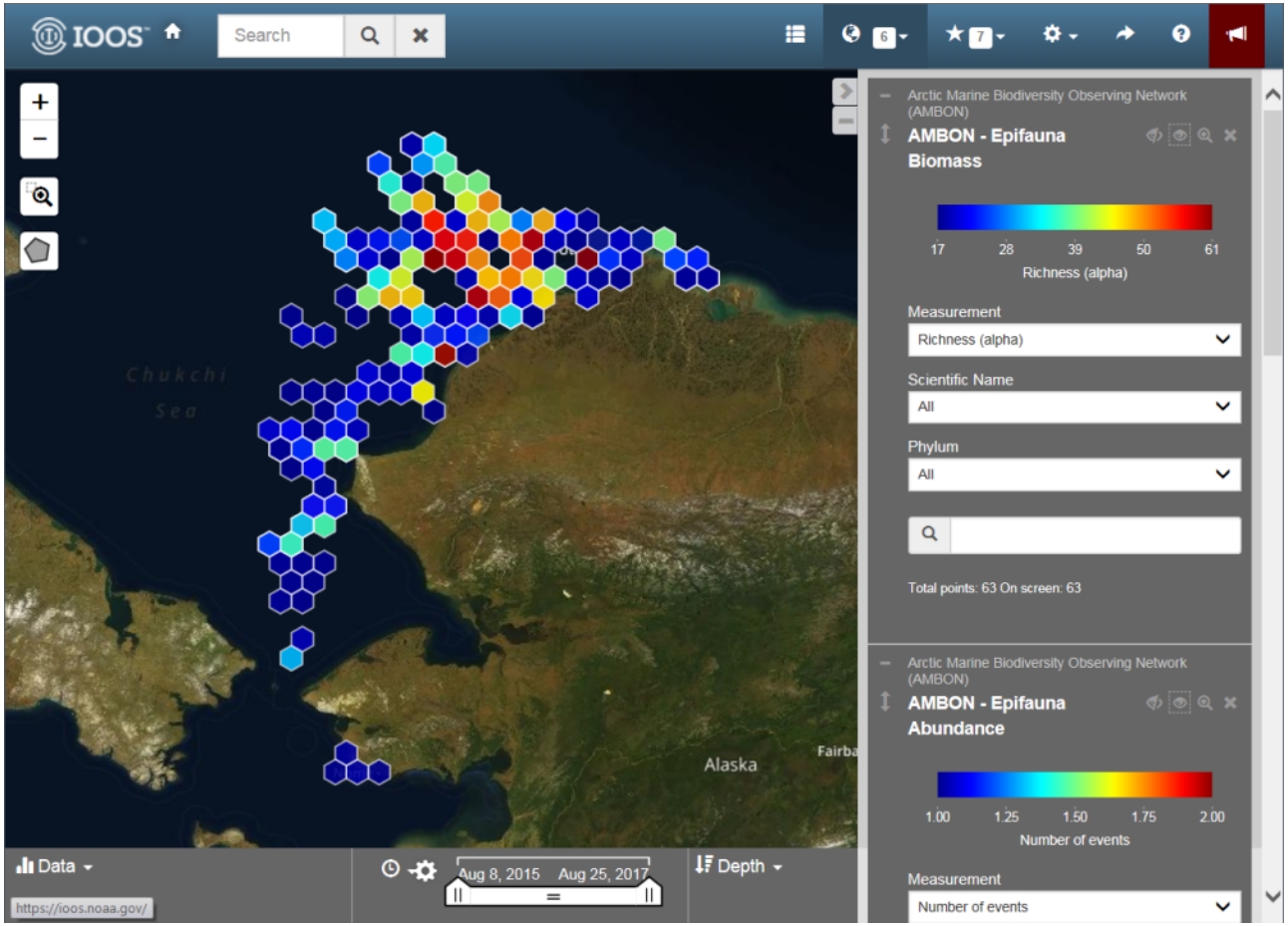
Seascape N= 17







- Test case for MBON data sets to OBIS
- AMBON data (2015, partial 2017) in MBON portal and discoverable
- https://mbon.ioos.us/ (quick demonstration by Brian Stone, Axiom Data Science)




Thank you!